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Brief
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

HENRY CHUNG

Docket: 30-4718 (4780)

Serial Number: 09/328,645

Group Art Unit: 2811

Filed: June 9, 1999

Examiner: H. Vu

For: A FABRICATION METHOD OF INTEGRATED CIRCUITS WITH
BORDERLESS VIAS AND LOW DIELECTRIC-CONSTANT INTER-METAL
DIELECTRICS

REPLY BRIEF FOR APPELLANT

Commissioner for Patents
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Sir:

This reply Brief is submitted in response to the new points of argument raised in the Examiner's Answer mailed June 17, 2003.

The examiner has rejected claims 5-7 under 35 U.S.C. 102 over Lu et al. The examiner is of the position that claims 5-7 are anticipated by the teachings of this reference. It is respectfully urged by Appellants, however, that this is not the case.

The examiner asserts in his Answer that Appellants' arguments rely on different elements of Lu et al.'s drawing figures than those used by the examiner. Appellants respectfully submit that the examiner's reliance on elements 144, 160, 172, and 174 of Fig. 1g, and elements 242, 260, 244, and 272, and 274 of Fig. 2b is incorrect. Thus, Appellants have relied on elements which would enable one skilled in the art to correctly compare and ascertain the differences between the present invention and Figs. 1g and 2b of Lu et al.

Referring to Fig. 1g, the examiner is of the position that Lu et al. discloses a substrate (102); a layer of a *first* polymeric dielectric material (142 or 144) on the substrate; a plurality of spaced apart metal contacts (160) on the first dielectric material; a space between adjacent metal contacts, each space being filled with a *second* polymeric dielectric material (144 or 172); a recess in the filled spaces of the layer of second polymeric dielectric material; an additional layer (172 or 174) of *first* polymeric dielectric material; and at least one via extending through this additional layer and extending to the top of at least one of the metal contacts.

It is urged that the examiner is incorrectly reconstructing the teachings of Lu et al. in light of the present invention's disclosure. The examiner first contends that element 144 of Lu et al.'s Fig. 1g is the *first* polymeric dielectric material, but then contends that 144 is the *second* polymeric dielectric material. The examiner next alleges that element 172 in Fig. 1g is the *second* polymeric dielectric material, but then states that this element 172 is the additional layer of the *first* polymeric dielectric material. Appellants respectfully submit that the examiner is merely adjusting his analysis of the Lu et al.'s drawing figures to accommodate his changing theories regarding the present invention.

Indeed, Lu et al. teaches a substrate 102 having a first dielectric layer thereon. However, while the examiner asserts that this first dielectric layer is shown in Fig. 1g as element 144, Appellants submit that layer 144 is not *on the substrate* as required by the present claims. Rather, it is urged that element 120 in Fig. 1g corresponds to the first dielectric layer *on the substrate*. Lu et al. then spin-coats an oxide liner 140 (a *second* dielectric layer) onto the top surface of the first dielectric layer 120. The oxide liner is then provided with metal interconnects 130 formed on liner 140. The spaces between the oxide liner coated metal interconnects 130 are filled with a xerogel 142 (a third dielectric layer), which may include recesses at the top of the xerogel 142 as shown in Fig. 1(g). A layer of hydrogen silsesquioxane (HSQ) 144 (a fourth dielectric) is then deposited on top of the layer 142 and in the recesses. An additional dielectric layer 146 is applied on top of the HSQ layer 144. Lu et al. does not teach that this additional dielectric layer 146 is present within the recesses between the interconnects. This recess is filled with hydrogen

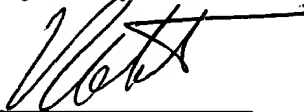
silsesquioxane which is used as an adhesion layer. Lu et al. also does not specify that dielectric layer 144 or 146 must be the same dielectric as used in dielectric 120, as is required by the present invention. Thus, it is urged that Lu et al. fails to teach the requirement of “an additional layer of the first polymeric dielectric material on at least some of the metal contacts and *in the recesses* on the filled spaces of the *second polymeric dielectric material*”. The above arguments also correspond to the examiner’s interpretation of the first and second polymeric dielectric material layers in Fig.2b of Lu et al.

Regarding Fig. 2b, the examiner is also of the position that either of layers 272 or 274 correspond to the presently claimed additional dielectric layer in the recesses. Applicants respectfully urge that this is not the case. Indeed, Lu et al. teaches the formation of interconnects 260 on a dielectric layer 246, as shown in Fig. 2(b). Lu et al. then spin-coats an oxide liner (second dielectric) 270 onto the interconnects and the top surface of the dielectric layer 246. The spaces between the interconnects are filled with a xerogel 272 (third dielectric), which may include recesses at the top of the xerogel 272 as shown in Fig. 2(b). A layer of hydrogen silsesquioxane (HSQ) (fourth dielectric) 274 is then deposited on top of the layer 272 and in the recesses, as shown in Fig. 2(b). Yet additional dielectric layer 276 is applied on top of the HSQ layer 274. Lu et al. does not teach that this additional dielectric layer 276 is present within the recesses between the interconnects. Rather, this recess is filled with hydrogen silsesquioxane which is used as an adhesion layer. Lu et al. also does not specify that upper layer dielectric 274 which is in the recess, or 276 *must* be the same dielectric as used in dielectric 246, as is required by the present claims. Thus, it is again urged that Lu et al. fails to teach the requirement of “an additional layer of the first polymeric dielectric material on at least some of the

metal contacts and *in the recesses* on the filled spaces of the *second polymeric dielectric material*".

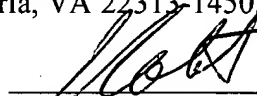
For the above reasons, it is again urged that the present invention is patentably distinct from Lu et al. Appellants therefore respectfully submit that the rejections of claims 5-7 under 35 U.S.C.102 should be overruled.

Respectfully submitted,



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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage pre-paid in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 10, 2003.



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